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THE IMPACT OF HEAT ON THE FAILURE OF MAN TRUCK TIRES IN UZBEKISTAN

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Annotation

This article analyzes the effect of heat, one of the main factors leading to the bursting of truck tires during operation. The effects of increased internal tire temperature, changes in the physical and mechanical properties of rubber materials, increased air pressure, and road and climatic conditions are scientifically covered. Practical recommendations are also given to prevent tire bursting.

Key words

truck, tire, heat, cracking, air pressure, rubber aging, operation.

ENTRANCE

Trucks play an important role in the transport system, and their reliable operation largely depends on the condition of their tires. Tires are the only element of a vehicle that directly contacts the road and operate under high loads, speeds, and various climatic conditions. Tires often burst, especially in hot summer weather. Therefore, studying the effect of heat on tire strength is an urgent issue.

Heat sources and tire temperature increase

The temperature in truck tires increases due to the following factors:

- high outdoor temperature;
- heating of the road surface (asphalt temperature can reach 60–70 °C);
- internal friction due to tire deformation;
- long-distance high-speed travel;
- exceeding the load limit.

When these factors act together, the temperature inside the tire rises sharply, creating a dangerous situation.

The effect of heat on tire materials

Tires are mainly composed of layers of rubber, textile, and metal cord. Under the influence of high temperatures:

- the elasticity of the rubber decreases;
- the material undergoes rapid aging;
- the adhesion between the layers weakens;
- microcracks appear, which grow larger over time.

As a result, the tire sidewall or tread may crack.

Relationship between air pressure and heat

According to the laws of physics, as temperature increases, the pressure of a gas in a closed volume also increases. When the air inside a tire heats up:

- internal pressure exceeds the norm;
- the force on the tire walls increases;
- The risk of cracking increases, especially in the sidewall (sidewall) area.

If the tire has previously been used at low pressure, the heating process will accelerate even more and the likelihood of a burst will increase dramatically.

RESEARCH RESULTS

Types of cracking caused by heat

The following cracks are most common under the influence of heat:

1. **Sidewall cracking** is the most dangerous type and is often caused by high temperatures and overloading.

2. **Tread separation** occurs as a result of the tire's inner layers overheating.

3. **Internal cord breakage** – the loss of strength of a metal or textile cord as a result of prolonged heat exposure.

Consequences of rupture

A truck tire blowout leads to the following negative consequences:

- increased risk of traffic accidents;
- loss of vehicle stability;
- material damage to cargo and vehicle;
- forced stops on the road and increased operating costs.

Measures to prevent cracks caused by heat exposure

The following measures are recommended to prevent the problem:

- constant monitoring of tire pressure;
- do not exceed the load specified by the manufacturer;
- maintain a moderate speed over long distances during the summer season;
- use of quality and certified tires;
- timely replacement of worn and cracked tires;
- making short stops to cool the tires on long trips.

Conclusion

- Thermal load has a strong direct and indirect effect on the cracking of automobile tires. High temperature deteriorates the mechanical properties of tire materials, increases internal pressure, and ultimately increases the risk of cracking. Therefore, this problem can be significantly reduced by strictly following the rules of proper use, maintenance, and operation of tires.

References

1. A.S. Litvinov, Ya.E. Farobin. Automobile: Theory of Performance Properties: Moscow: Mashinostroenie, 1989. - 240 p.: ill.
2. N.A. Yakovlev, N.V. Divakov: Theory of the Automobile: Moscow: Vysshaya shkola, 1962. - 300 p.: ill.
3. Automobile Tire Operation. Ed. V.N. Knoroz. Moscow, Transport, 1976. - 238 p.: ill.
4. Volodina T.N., Gorskaya L.P., Gladkikh S.A., Kalinkovsky V.S., Putankin K.S., Trofimov S.A. Modern Tire Design Methodology Using Calculation and Experimental Methods // Proceedings of the Tenth Symposium. "Problems of tires and rubber-cord composites. Tenth anniversary symposium" / TUP "NIIShP". Moscow, 1999. // Rubber and Resin 2001. No. 2. P. 43.
5. Rakhmatov, Murodjon Iskandarovich, Sharopov Zavqiddin Zayniddinovich, and Boliyev Mansur Tuygunovich. "Methods of Maintenance of Automobile Transport Engines." Nexus: Journal of Advances Studies of Engineering Science 1.4 (2022): 90-92.
6. Rakhmatov, Murodjon Iskandarovich, Sharopov Zavqiddin Zayniddinovich, and Boliyev Mansur Tuygunovich. "Maintenance and Repair of the Steering Mechanisms of the

Car." CENTRAL ASIAN JOURNAL OF MATHEMATICAL THEORY AND COMPUTER SCIENCES 4.2 (2023): 108-112.
7. Rakhmatov, Murodjon Iskandarovich, Sharopov Zavqiddin Zayniddinovich, and Boliyev Mansur Tuygunovich. "Analysis of Cardan Shaft Defects and Ways to Restore Them." Vital Annex: International Journal of Novel Research in Advanced Sciences 1.3 (2022): 135-137.
8. Iskandarovich, Rakhmatov Murodjon, Sharopov Zavqiddin Zayniddinovich, and Boliyev Mansur Tuygunovich. "Construction of a fuel supply system for vehicles running on compressed gas and their maintenance." Nexus: World of Scientific news in Science International Journal 1.1 (2023): 54-65.

9. Boliyev Mansur Tuygunovich. “A method of conducting experiments on the production of car tires and the disposal of obsolete car tires” International journal of artificial intelligence (2025): 44-47.